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FAX COVER SHEET

Company: USPTO- GAU 2874 From: Wendy W. Koba

Attention: Michelle Connelly Cushwa Date: 7/22/03

Fax No.: 703-746-4762

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Michelle,

Attached please find some background info on evanescent coupling that I found useful - look for a "draft" amendment to the spec & claims by 10AM tomorrow.

Thanks -

Wendy Koba

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Evanescent Prism Coupling

When an optical beam passes through a prism and undergoes a total internal reflection at the base, the evanescent fields that extend below the prism base can penetrate into the waveguide and transfer power between the incident beam and the waveguide modes (Figure (1)). By reciprocity, a prism can also couple light out of the waveguide. Each propagating mode will be coupled out of the guide at an angle that is characteristic of that particular mode. The prism's input coupling efficiency is a function of the coupling length at the base of the prism. The input beam has to be aligned exactly near the right-angle edge of the prism otherwise light begins to couple back out of the prism.

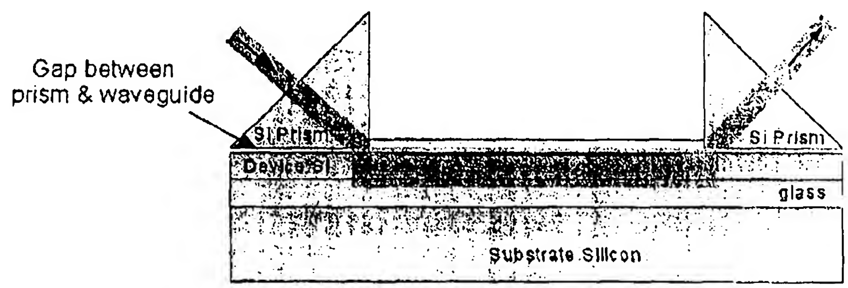

Figure 1. Schematic of prism coupling method.

The process of coupling light via overlapping mode tails, while the incident beam tends to be totally internally reflected in the prism, is sometimes called *optical tunneling*, because it is analogous to the *quantum mechanical* tunneling of a particle through an energy barrier. For a Gaussian beam shape, maximum coupling efficiency is about 80 %.

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Evanescent coupling is typically used to couple light in and out of thin waveguides where direct launch of focused light is very inefficient due to small cross section of the waveguides (typically for waveguide thickness below 2-3 micrometers). In Evanescent coupling, a prism or a grating, made out of a material with the refractive index equal to or larger than the refractive index of the waveguide, is separated from the waveguide by a gap formed using a material (or air) of lower refractive index. (see figures 53, 54, 55,56,57,58). An optical beam passes through a prism (or grating) and undergoes a total internal reflection at the base; the evanescent fields that extend below the prism (or grating) base can penetrate into the waveguide and transfer power between the incident beam and the waveguide. For a given mode in the waveguide, the mode angle of the waveguide (also depends on the waveguide thickness and the wavelength of the incident beam) must match the angle of incidence of the input beam. The position of the incident beam with respect to the edge of the prism (or grating) is also important in order to avoid coupling of evanescent field back into prism (or grating). The thickness, refractive index and the shape (e.g. constant gap , tapered gap) must be precisely chosen to achieve maximum coupling of a specific mode into the waveguide. For detailed description of the physics please refer to pages 99-103 of the book "Integrated Optics- theory and technology by Robert Hunsperger, Publisher- Springer, fourth Edition, 1995." (see attached word file with scanned pages)

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